

Motordriven tool such as a pole hedge trimmer with a locking mechanism for the turnable cutting unit.

5 This invention relates to a motor driven tool such as a pole hedge trimmer, a pole saw or the like comprising a drive unit that via a shaft tube is connected to a cutting unit which is turnably secured to the shaft tube.

Hedge trimmers and saws of the type mentioned above are provided with shaft tubes of different lengths and are used for trimming small as well as large trees, hedges, bushes and the like. These tools, that are provided with a handle having necessary control means for operating the drive unit and a further handle placed at the shaft tube, make it possible to find a comfortable working position when trimming bushes and trees and hedges since i.a. the cutting unit can be turned with respect to the shaft tube. This means that the operator before the work starts can put the cutting unit in a suitable angular position in order to adapt the severing or cutting means to the working position of the operator. However, the tools of today are designed such that the adjustment means are placed in close vicinity of the cutting unit. This means that adjustment operation is complicated since the operator is forced to leave hold of one or both handles in order to reach the locking means. Then the cutting unit has to be turned by means of a special handle before it is locked in its new position. The locking means and the special handle are usually also placed such that there is a risk that the operator gets injured by the cutting or severing parts of the cutting unit.

It is also previously known, see US 4651420, to provide a pole cutter with an angle adjustment means for the cutter unit. The cutter unit is driven by the reciprocating motion of a Bowden cable and the adjustment means comprises a pivotable handle that via a rod is connected to the cutter unit support. The handle can be locked in different position by means of a toothed latch. This arrangement is however very poor and is not acceptable from a safety point of view since the latch can easily disengage from the handle which would cause the cutter unit to move uncontrolled. Moreover to change the angular position of the cutter unit the operator has to turn off the engine and move one of his hands from the grip to the latch to choose a new position for the latch before starting the engine again.

The purpose of this invention is to create an arrangement simplifying the adjustment procedure whereby the operator can turn the cutting unit with respect to the

shaft tube mainly with preserved grip about the handle parts. This is achieved by means of a device having the characteristics mentioned in the claims.

Several embodiments of the invention will now be described with reference to the accompanying drawings on which Fig. 1 is a perspective view of a pole hedge trimmer of the type in question, Fig. 2 is a perspective view of a first embodiment of the adjusting arrangement, Fig. 3 is a section through a part of the arrangement shown in Fig. 2, Fig. 4 is a section through another part of the arrangement shown in Fig. 2, Fig. 5 is a perspective view of a second embodiment of the adjustment arrangement, Fig. 6 is a side view of the locking arrangement shown in Fig. 5, Fig. 7 is a section on the line VII-VII in Fig. 6 whereas Fig. 8 is a further embodiment of the locking mechanism.

As appears from Fig. 1 the pole hedge cutter comprises a drive unit 11 which via a shaft tube 12 is connected to a cutting unit 13. The drive unit 11 can be of any type such as an internal combustion engine or an electric motor whose output shaft is connected to a drive shaft, not shown, that is placed within the shaft tube and that via a gear 14 is connected to the cutting unit. The shaft tube 12 has an inner handle 15 that is provided with throttle control means and additional control means for the drive unit and an outer handle 16 designed as a sleeve of grip friendly material. The cutting unit 13 in a conventional manner is provided with stationary, comb shaped knife protectors co-operating with corresponding knives arranged to move forwards/backwards and being driven by the drive shaft via the gear 14. The cutting unit 13 is by means of a turnable connection A supported by the shaft tube 12. The turnable connection comprises a braking and locking means L that can be released by means of a control means M arranged close to the outer handle.

According to the embodiment shown in Fig. 2 the control means M comprises a turnable handle designed as a sleeve 17 and arranged outside the shaft tube 12 close to the outer handle 16. The sleeve 17 that preferably is provided with an outer shell of grip friendly material is at one of its end provided with an outer gear rim 18, see Fig. 3, co-operating with a tube socket 19 provided with a gear rim engaging the gear rim 18. The tube socket 19 is turnably supported in a gear box 20 surrounding the gear mechanism. The tube socket 19 drives a turning rod 21 having one end which is wave shaped and slideably arranged in a pocket of the tube socket 19 such that the turning rod follows the turning motion of the gear wheel at the same time as it has the possibility to move in the axial direction. The other end 23 of the turning rod is threaded and inserted into a lug 24 serving as a nut at the turnable connection A. The end part of the turning rod that

extends from the lug is arranged to act on a lever 25 which is a part of the locking mechanism L. The lever 25 is supported for turning motion about a stub shaft 26 and has an abutment surface 27 resting against one end of a sleeve 28 whose other end rests against a shoulder 29 which is a part of a clamp connection arranged at the bearing 5 housing and comprising a clamping ring 30 surrounding a turning shaft, not shown, of the cutting unit. The clamping ring 30 also comprises a shoulder 31 in which a screw 32 is threaded the screw being freely movable in a through hole in the shoulder 29 and being provided with a screw head 33 which is placed in the sleeve 28. Between the screw head 33 and the shoulder 29 there are several spring washers 34. In order to 10 prevent branches from getting entangled between the shaft tube 12 and the turning rod 21 it is covered by a protecting shell 35 which is secured to the shaft tube.

The arrangement shown in Fig. 2-4 operates in the following manner. When the operator desires to change the position of the cutting unit the sleeve 17 is turned which means that the tube socket 19 follows the motion and acts on the turning rod such that it 15 by means of its threaded engagement with the lug 24 is moved axially to the left in Fig. 4 and hence influences the lever 25. This means that the lever is turned clockwise about the stub shaft 26 until the abutting surface 27 does not abut the sleeve 28 any longer which means that the shoulder 29 moves to the left in the figure such that the clamp ring 30 loosens its grip about the turning shaft of the cutting unit. Because of the force created 20 by the screw 32 and the spring washers 34 on the shoulder 29 a certain grip about the turning shaft is maintained. By pressing the cutting unit 13 against the ground or some other kind of counter acting object, thereby overcoming the braking moment that the spring washers create, the angle of the cutting unit with respect to the shaft tube 12 can now be changed. Then the cutting unit 13 is locked by turning the sleeve 17 in the 25 opposite direction which means that the lever 25 will press the sleeve 28 against the shoulder 29 such that the distance between the two shoulders 29, 31 decreases thereby locking the clamping ring 30 about the turning shaft of the cutting unit.

At the embodiment shown in Fig. 5-7 the control means M comprises an arm 39 which by means of a shaft 40 is turnably supported between two side walls 41 arranged 30 on the shaft tube 41. The shaft 40 supports a pocket, not shown, which in the same manner as has been mentioned at the embodiments described above encloses one end of a turning rod 42 such that it can be moved axially at the same time as it is turned. The other end of the turning rod is threaded and inserted into a central, tube shaped, threaded opening 43 arranged in a screw 44 which is threaded into a bearing housing 45

surrounding the turning shaft , not shown, of the cutting unit. The bearing housing 45 is provided with a recess 46 directed towards the turning shaft and comprising a brake pad 47 movable in the radial direction. Between the brake pad 47 and the inner end of the screw 44 there are several spring washers 48 having a central opening in which the 5 turning rod 42 is freely movable and arranged such that it abuts the brake pad 47.

The arrangement shown in Fig. 5-7 operates in the following manner. In order to adjust the angle of the cutting unit 13 with respect to the shaft tube 12 the arm 39 is acted on whereby the turning motion is transferred to the turning rod 42. This means that the turning rod by means of the engagement with the screw 44, which is stationary 10 arranged in the brake drum, is moved axially towards the left in Fig. 7 such that the grip from the brake pad 47 on the cutting unit turning shaft, which is inserted in the surrounding bearing housing 45, ceases. Because of the spring force created by the spring washers on the brake pad 47 a certain braking moment on the turning shaft of the cutting unit is retained. This means that the operator can then push the cutting unit 15 against a suitable counter acting object for instance the ground, in order to achieve a force by means of which the cutting unit can be turned with respect to the shaft tube. In order to lock the cutting unit in the new position the arm 39 is moved back to its original position which means that the turning rod will move towards the right in Fig. 6 and thereby push the brake pad 47 against the turning shaft. In order to set a suitable 20 braking moment when the locking function is not activated the screw 44 can be turned such that the force created by the spring washers 48 against the brake pad 47 is changed in a suitable way.

The embodiment of the locking mechanism L shown in Fig. 8, in the same manner as in the embodiments previously described, comprise a turning rod 50 which is influenced by a control means the end of the turning rod extending through a threaded 25 through opening 51 of one of two legs 52, 53 of a U-shaped clamp shoe 54. The clamp shoe 57 partly surrounds two shoulders 55, 56 of a clamp ring 57 arranged on a bearing housing the clamp ring surrounding the turning shaft, not shown, of the cutting unit. The clamp shoe 57 has a slot 58 separating the two shoulders 55, 56 which are each 30 provided with a through hole 59, 60 that are coaxial with the hole 51. The hole 59 is threaded and supports a screw 61 having one end abutting the end of the turning rod 50 and being partly threaded into the hole 59 whereas the screw runs freely through the hole 60. Further there are several spring washers 62 surrounding the screw 61 and placed between the shoulder 56 and the head 63 of the screw 61.

The locking mechanism described in Fig. 8, which might be used together with anyone of the control means M being previously described, operates in the following manner. When the locking function is to be loosed the control means is actuated such that the turning rod 59 becomes a turning motion which means that the turning rod 5 because of the threaded engagement with the leg 52 of the clamp shoe 54 is moved towards the left in Fig. 8 with respect to the clamp shoe 54 such that the end of the turning rod 50 which is freely movable in the opening 59 disengages the end of the screw 61. This means that the force which is transferred from the clamp shoe 54 via the leg 53 to the screw head 63 ceases such that the locking effect disappears at the same 10 time as a certain grip remains between the turning shaft of the cutting unit and the bearing housing because of the clamping force created by the spring washers 62. The operator can then change the angle of the cutting unit 13 with respect to the shaft tube in a manner described previously after which the control means is influenced to again lock the cutting unit in the new position.

15 It should in this connection be pointed out that the combination of the control means M and the locking means L which has been shown in the embodiments is solely illustrative and that it of course is possible to use them in any combination. It should also be stressed that even if the embodiments mentioned above relate to hedge trimmers the described arrangements are applicable also for similar types of tools such as for pole 20 saws (i.e. saws on which a guide plate with a saw chain is arranged at the upper part of the shaft tube and a drive unit is arranged at the lower part of the shaft tube) clearing saws and trimmers having cutting units with saw blades and cutting filaments.